

1-methylbutyl, 1-methylpentyl, 1-methylhexyl, 1-methylheptyl, 1-methyloctyl, 1-methylnonyl, 1-methyldecyl, 2-methylpropyl, 2-methylbutyl, 2-methylpentyl, 2-methylhexyl, 2-methylheptyl, 2-methyloctyl, 2,3,3-trimethylbutyl, 3-methylpentyl, 2,3-dimethylpentyl, 2,4-dimethylpentyl, 2,3,3,4-tetramethylpentyl, 3-methylhexyl, and 2,5-dimethylhexyl.

17. The process of claim 13 wherein said maleated polyalkylene comprises mer units derived from at least one of ethylene and propylene.

18. The process of claim 13 wherein said amine comprises from 1 to 50 carbon atoms and is selected from at least one of alkyl amines, alkyl benzyl amines, alkyl phenyl amines, alkoxybenzyl amines, alkyl aminobenzoates, and alkoxy aniline.

19. The process of claim 13 wherein said amine is a primary amine.--

#### REMARKS

Upon reviewing the claims as filed, Applicants have chosen to modify the format and dependency of some and have added 6 claims dependent from original claim 13.

Included herewith is a set of marked-up claims indicating where claims have been amended. Also enclosed is a clean set of presently pending claims, *which is provided merely for the convenience of the examiner and is not intended to be form part of the official record.*

No fee is believed to be necessary for entry of this amendment. Nevertheless, the accompanying transmittal letter gives certain deposit account information and authorization.

An information disclosure statement is being prepared and will be submitted within the next few months.

Questions and comments regarding this submission and the application in general should be directed to the attention of the undersigned.

Respectfully submitted,

*David G. Burleson*

David G. Burleson

Reg. No. 38,090

Attorney for Applicants

Date: September 20, 2001

Bridgestone/Firestone Inc., Law Dept.  
1200 Firestone Parkway  
Akron, Ohio 44317-0001

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

3 (amended). The process of [any of] claim[s] 1 [to 2] wherein said polymer comprises from about 0.01 to about 5 weight percent mer units derived from maleic anhydride.

4 (amended). The process of [any of] claim[s] 1 [to 3] wherein steps b), c) and, optionally a) are carried out sequentially in a mixer, with no physical manipulation of said polyalkylene grafted interpolymer prior to step c) and without removing any of the materials from said mixer.

5 (amended). The process of [any of] claim[s] 1 [to 4] wherein step c) includes mixing about 10 [weight percent] to about 90 weight percent of said polyalkylene-grafted interpolymer with a total amount of about 90 [weight percent] to about 10 weight percent of said extender.

6 (amended). The process of [any of] claim[s] 1 [to 5] wherein at least one of the following is true:

said vinyl aromatic monomer is selected from any one or more of styrene,  $\alpha$ -methylstyrene, *p*-methylstyrene, 4-phenylstyrene, *m*-methylstyrene, *o*-methylstyrene, *p*-tert-butylstyrene, and dimethylstyrene; and

$R^1$  and  $R^2$  independently are selected from methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, isopentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, cyclopropyl, 2,2-dimethylcyclopropyl, cyclopentyl, cyclohexyl, methoxymethyl, methoxyethyl, methoxypropyl, methoxybutyl, methoxypentyl, methoxyhexyl, methoxyoctyl, methoxynonyl, ethoxydecyl, ethoxymethyl, ethoxyethyl, ethoxypropyl, ethoxybutyl, ethoxypentyl, ethoxyhexyl, ethoxyheptyl, ethoxyoctyl, ethoxynonyl, ethoxydecyl, propoxymethyl, propoxyethyl, propoxypropyl, propoxybutyl, propoxypentyl, propoxyheptyl, propoxyoctyl, propoxynonyl, propoxydecyl, butoxymethyl, butoxyethyl, butoxypropyl, butoxybutyl, butoxypentyl, butoxyhexyl, butoxyheptyl, butoxyoctyl, butoxynonyl, butoxydecyl, pentyloxymethyl, pentyloxyethyl, pentyloxypropyl, pentyloxybutyl, pentyloxypentyl, pentyloxyhexyl, pentyloxyoctyl, pentyloxynonyl,

pentyloxydecyl, hexyloxymethyl, hexyloxyethyl, hexyloxypropyl, hexyloxybutyl, hexyloxy-pentyl, hexyloxyhexyl, hexyloxyheptyl, hexyloxyoctyl, hexyloxynonyl, hexyloxydecyl, heptyloxymethyl, heptyloxyethyl, heptyloxypropyl, heptyloxybutyl, hexyloxypentyl, heptyloxyhexyl, heptyloxyheptyl, heptyloxyoctyl, heptyloxynonyl, heptyloxydecyl, octyloxymethyl, octyloxy-ethyl, octyloxypropyl, octyloxybutyl, octyloxypentyl, octyloxyhexyl, octyloxyheptyl, octyloxy-octyl, octyloxynonyl, decyloxymethyl, decyloxyethyl, decyloxypropyl, decyloxybutyl, decyl-oxypentyl, decyloxyhexyl, decyloxyheptyl, 1-methylethyl, 1-methylpropyl, 1-methylbutyl, 1-methylpentyl, 1-methylhexyl, 1-methylheptyl, 1-methyloctyl, 1-methylnonyl, 1-methyldecyl, 2-methylpropyl, 2-methylbutyl, 2-methylpentyl, 2-methylhexyl, 2-methylheptyl, 2-methyloctyl, 2,3,3-trimethylbutyl, 3-methylpentyl, 2,3-dimethylpentyl, 2,4-dimethylpentyl, 2,3,3,4-tetra-methylpentyl, 3-methylhexyl, and 2,5-dimethylhexyl.

7 (amended). The process of [any of] claim[s] 1 [to 6] wherein said maleated polyalkylene includes mer units derived from at least one of ethylene and propylene.

8 (amended). The process of [any of] claim[s] 1 [to 7] wherein, prior to step a), an amine is reacted with a portion of the mer units derived from the maleic anhydride to form maleimide mer units, wherein at least one of the following optionally is true of said imidization:

it is carried out immediately preceding step a) with no physical manipulation of the polymer prior to step a), and

it and step a) are carried out in a mixer without removing the imidization product from the mixer.

11 (amended). The process of [any of] claim[s] 1 [to 8] wherein said diamine is selected from aliphatic or cycloaliphatic diamines corresponding to the general formula  $R^3(NH_2)_2$  wherein  $R^3$  represents

- 1) a  $C_2$ - $C_{20}$  aliphatic hydrocarbon group,
- 2) a  $C_4$ - $C_{20}$  cycloaliphatic hydrocarbon group,
- 3) a  $C_6$ - $C_{20}$  aromatic hydrocarbon group, or
- 4) a  $C_4$ - $C_{20}$  N-heterocyclic ring.

14 (new). The process of claim 13 wherein said interpolymer that reacts with said amine in step a) comprises from about 0.01 to about 5 weight percent mer units derived from maleic anhydride.

15 (new). The process of claim 13 wherein said vinyl aromatic-derived mer units are derived from any one or more of styrene,  $\alpha$ -methylstyrene, *p*-methylstyrene, 4-phenylstyrene, *m*-methylstyrene, *o*-methylstyrene, *p*-tert-butylstyrene, and dimethylstyrene.

16 (new). The process of claim 13 wherein R<sup>1</sup> and R<sup>2</sup> independently are selected from methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, isopentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, cyclopropyl, 2,2-dimethylcyclopropyl, cyclopentyl, cyclohexyl, methoxymethyl, methoxyethyl, methoxypropyl, methoxybutyl, methoxypentyl, methoxyhexyl, methoxyoctyl, methoxynonyl, ethoxydecyl, ethoxymethyl, ethoxyethyl, ethoxypropyl, ethoxybutyl, ethoxypentyl, ethoxyhexyl, ethoxyheptyl, ethoxyoctyl, ethoxynonyl, ethoxydecyl, propoxymethyl, propoxyethyl, propoxypropyl, propoxybutyl, propoxypentyl, propoxyheptyl, propoxyoctyl, propoxynonyl, propoxydecyl, butoxymethyl, butoxyethyl, butoxypropyl, butoxybutyl, butoxypentyl, butoxyhexyl, butoxyheptyl, butoxyoctyl, butoxynonyl, butoxydecyl, pentyloxymethyl, pentyloxyethyl, pentyloxypropyl, pentyloxybutyl, pentyloxypentyl, pentyloxyhexyl, pentyloxyoctyl, pentyloxynonyl, pentyloxydecyl, hexyloxymethyl, hexyloxyethyl, hexyloxypropyl, hexyloxybutyl, hexyloxypentyl, hexyloxyhexyl, hexyloxyheptyl, hexyloxyoctyl, hexyloxynonyl, hexyloxydecyl, heptyloxymethyl, heptyloxyethyl, heptyloxypropyl, heptyloxybutyl, heptyloxypentyl, heptyloxyhexyl, heptyloxyheptyl, heptyloxyoctyl, heptyloxynonyl, heptyloxydecyl, octyloxymethyl, octyloxyethyl, octyloxypropyl, octyloxybutyl, octyloxypentyl, octyloxyhexyl, octyloxyheptyl, octyloxyoctyl, octyloxynonyl, decyloxymethyl, decyloxyethyl, decyloxypropyl, decyloxybutyl, decyloxypentyl, decyloxyhexyl, decyloxyheptyl, 1-methylethyl, 1-methylpropyl, 1-methylbutyl, 1-methylpentyl, 1-methylhexyl, 1-methylheptyl, 1-methyloctyl, 1-methylnonyl, 1-methyldecyl, 2-methylpropyl, 2-methylbutyl, 2-methylpentyl, 2-methylhexyl, 2-methylheptyl, 2-methyloctyl, 2,3,3-trimethylbutyl, 3-methylpentyl, 2,3-dimethylpentyl, 2,4-dimethylpentyl, 2,3,3,4-tetramethylpentyl, 3-methylhexyl, and 2,5-dimethylhexyl.

17 (new). The process of claim 13 wherein said maleated polyalkylene comprises mer units derived from at least one of ethylene and propylene.

18 (new). The process of claim 13 wherein said amine comprises from 1 to 50 carbon atoms and is selected from at least one of alkyl amines, alkyl benzyl amines, alkyl phenyl amines, alkoxybenzyl amines, alkyl aminobenzoates, and alkoxy aniline.

19 (new). The process of claim 13 wherein said amine is a primary amine.

1. A process for forming an extended polyalkylene-grafted interpolymer or gel, comprising:
  - a) mixing
    - 1) a polymer comprising mer units derived from maleic anhydride and mer units derived from at least one of
      - (A) a vinyl aromatic monomer, and
      - (B) an R<sup>1</sup>(R<sup>2</sup>)ethylene monomer in which R<sup>1</sup> and R<sup>2</sup> independently are selected from H and substituted or unsubstituted C<sub>1</sub>-C<sub>20</sub> alkyl or alkoxy groups, and
    - 2) a maleated polyalkylene, so as to form a blend;
  - b) to said blend, adding a diamine and allowing it to react with the mer units derived from maleic anhydride and with the maleated polyalkylene to form a polyalkylene grafted interpolymer; and
  - c) allowing the polyalkylene-grafted interpolymer to cool in said mixer and adding an extender to provide said extended polyalkylene-grafted interpolymer; and
  - d) optionally, extruding the extended polyalkylene-grafted interpolymer to form a gel having a tan  $\delta$  of at least 0.3.
2. The process of claim 1 wherein step a) includes from about 50 to about 99 weight % of said polymer and from about 1 to about 50 weight % of said maleated polyalkylene and wherein step b) includes from about 0.1 to about 10 weight % of said diamine.
3. The process of claim 1 wherein said polymer comprises from about 0.01 to about 5 weight percent mer units derived from maleic anhydride.
4. The process of claim 1 wherein steps b), c) and, optionally a) are carried out sequentially in a mixer, with no physical manipulation of said polyalkylene grafted interpolymer prior to step c) and without removing any of the materials from said mixer.
5. The process of claim 1 wherein step c) includes mixing about 10 to about 90 weight percent of said polyalkylene-grafted interpolymer with a total amount of about 90 to about 10 weight percent of said extender.

Q

6. The process of claim 1 wherein at least one of the following is true:

said vinyl aromatic monomer is selected from any one or more of styrene,  $\alpha$ -methylstyrene, *p*-methylstyrene, 4-phenylstyrene, *m*-methylstyrene, *o*-methylstyrene, *p*-tert-butylstyrene, and dimethylstyrene; and

$R^1$  and  $R^2$  independently are selected from methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, isopentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, cyclopropyl, 2,2-dimethylcyclopropyl, cyclopentyl, cyclohexyl, methoxymethyl, methoxyethyl, methoxypropyl, methoxybutyl, methoxypentyl, methoxyhexyl, methoxyoctyl, methoxynonyl, ethoxydecyl, ethoxymethyl, ethoxyethyl, ethoxypropyl, ethoxybutyl, ethoxypentyl, ethoxyhexyl, ethoxyheptyl, ethoxyoctyl, ethoxynonyl, ethoxydecyl, propoxymethyl, propoxyethyl, propoxypropyl, propoxybutyl, propoxypentyl, propoxyheptyl, propoxyoctyl, propoxynonyl, propoxydecyl, butoxymethyl, butoxyethyl, butoxypropyl, butoxybutyl, butoxypentyl, butoxyhexyl, butoxyheptyl, butoxyoctyl, butoxynonyl, butoxydecyl, pentyloxymethyl, pentyloxyethyl, pentyloxypropyl, pentyloxybutyl, pentyloxypentyl, pentyloxyhexyl, pentyloxyoctyl, pentyloxynonyl, pentyloxydecyl, hexyloxymethyl, hexyloxyethyl, hexyloxypropyl, hexyloxybutyl, hexyloxy-pentyl, hexyloxyhexyl, hexyloxyheptyl, hexyloxyoctyl, hexyloxynonyl, hexyloxydecyl, heptyloxymethyl, heptyloxyethyl, heptyloxypropyl, heptyloxybutyl, heptyloxypentyl, heptyloxyhexyl, heptyloxyheptyl, heptyloxyoctyl, heptyloxynonyl, heptyloxydecyl, octyloxymethyl, octyloxyethyl, octyloxypropyl, octyloxybutyl, octyloxypentyl, octyloxyhexyl, octyloxyheptyl, octyloxyoctyl, octyloxynonyl, decyloxymethyl, decyloxyethyl, decyloxypropyl, decyloxybutyl, decyloxypentyl, decyloxyhexyl, decyloxyheptyl, 1-methylethyl, 1-methylpropyl, 1-methylbutyl, 1-methylpentyl, 1-methylhexyl, 1-methylheptyl, 1-methyloctyl, 1-methylnonyl, 1-methyldecyl, 2-methylpropyl, 2-methylbutyl, 2-methylpentyl, 2-methylhexyl, 2-methylheptyl, 2-methyloctyl, 2,3,3-trimethylbutyl, 3-methylpentyl, 2,3-dimethylpentyl, 2,4-dimethylpentyl, 2,3,3,4-tetramethylpentyl, 3-methylhexyl, and 2,5-dimethylhexyl.

7. The process of claim 1 wherein said maleated polyalkylene includes mer units derived from at least one of ethylene and propylene.

8. The process of claim 1 wherein, prior to step a), an amine is reacted with a portion of the mer units derived from the maleic anhydride to form maleimide mer units, wherein at least one of the following optionally is true of said imidization:

it is carried out immediately preceding step a) with no physical manipulation of the polymer prior to step a), and

it and step a) are carried out in a mixer without removing the imidization product from the mixer.

9. The process of claim 8, wherein said amine comprises from 1 to 50 carbon atoms and is selected from at least one of alkyl amines, alkyl benzyl amines, alkyl phenyl amines, alkoxybenzyl amines, alkyl aminobenzoates, and alkoxy aniline.

10. The process of claim 8, wherein said amine is a primary amine.

11. The process of claim 1 wherein said diamine is selected from aliphatic or cycloaliphatic diamines corresponding to the general formula  $R^3(NH_2)_2$  wherein  $R^3$  represents

- 1) a  $C_2$ - $C_{20}$  aliphatic hydrocarbon group,
- 2) a  $C_4$ - $C_{20}$  cycloaliphatic hydrocarbon group,
- 3) a  $C_6$ - $C_{20}$  aromatic hydrocarbon group, or
- 4) a  $C_4$ - $C_{20}$  N-heterocyclic ring.

12. The process of claim 11, wherein said diamine is selected from at least one of ethylene diamine; 1,2-propylene diamine; 1,3-propylene diamine; 1,4-diaminobutane; 2,2-dimethyl-1,3-diaminopropane; 1,6-diaminohexane; 2,5-dimethyl-2,5-diaminohexane; 1,6-diamino-2,2,4-trimethyldiaminohexane; 1,8-diaminooctane; 1,10-diaminodecane; 1,11-diaminoundecane; 1,12-diaminododecane; 1-methyl-4-(aminoisopropyl)-cyclohexylamine; 3-aminomethyl-3,5,5-trimethyl-cyclohexylamine; 1,2-bis-(aminomethyl)-cyclobutane; 1,2-diamino-3,6-dimethylbenzene; 1,2-diaminocyclohexane; 1,4-diaminocyclohexane; 1,2-diaminodecalin; 1,4-diaminodecalin; 1,5-diaminodecalin; 1,8-diaminodecalin; 1-methyl-4-aminoisopropyl-cyclohexylamine; 4,4'-diamino-dicyclohexyl; 4,4'-diamino-dicyclohexyl methane; 2,2'-(bis-4-amino-cyclohexyl)-propane; 3,3'-dimethyl-4,4'-diamino-dicyclohexyl methane; 1,2-bis-(4-aminocyclohexyl)-ethane; 3,3',5,5'-tetramethyl-bis-(4-aminocyclohexyl)-methane; 3,3',5,5'-tetramethyl-bis-(4-aminocyclohexyl)-propane; 1,4-bis-(2-aminoethyl)-benzene; benzidine; 4,4'-thiodianiline; 3,3'-dimethoxybenzidine; 2,4-diaminotoluene; diamino-ditolylsulfone; 2,6-diaminopyridine; 4-methoxy-6-methyl-*m*-phenylenediamine; diamino-diphenyl ether; 4,4'-bis(*o*-toluidine); *o*-phenylenediamine; methylene-bis(*o*-chloroaniline); bis(3,4-diaminophenyl)sulfone; diaminodiphenylsulfone; 4-chloro-*o*-phenylenediamine; *m*-aminobenzylamine; *m*-phenylenediamine; 4,4'- $C_1$ - $C_6$ -dianiline; aniline-formaldehyde resin; trimethylene glycol di-*p*-aminobenzoate; bis-(2-aminoethyl)-amine; bis-(3-aminopropyl)-amine; bis-(4-aminobutyl)amine; bis-(6-aminoethyl)-amine; and isomeric mixtures of dipropylene triamine and dibutylene triamine.

13. A single batch process for preparing a polymer composition which includes a polyalkylene-grafted interpolymers, said process comprising:

- a) forming a maleimide interpolymers in a mixing vessel by reacting an amine with a portion of maleic anhydride-derived mer units of an interpolymers comprising maleic anhydride-derived mer units and at least one of
  - 1) vinyl aromatic-derived mer units, and
  - 2)  $R^1(R^2)$ ethylene-derived mer units in which  $R^1$  and  $R^2$  independently are H or substituted or unsubstituted  $C_1$  to  $C_{20}$  alkyl groups or alkoxy groups;
- b) adding sufficient maleated polyalkylene such that the mixing vessel contains from about 1 to about 50 weight percent maleated polyalkylene and from about 50 to about 99 weight percent maleimide interpolymers;
- c) mixing from about 0.1 to about 10 weight % of a diamine with the maleimide interpolymers and maleated polyalkylene in the mixing vessel to form said polyalkylene-grafted interpolymers; and
- d) optionally, without removing the product of step c) from the vessel, cooling the polyalkylene-grafted interpolymers in the mixer to a temperature at which an extender is stable in the polyalkylene-grafted interpolymers, and adding an extender to the mixer.

14. The process of claim 13 wherein said interpolymers that reacts with said amine in step a) comprises from about 0.01 to about 5 weight percent mer units derived from maleic anhydride.

15. The process of claim 13 wherein said vinyl aromatic-derived mer units are derived from any one or more of styrene,  $\alpha$ -methylstyrene, *p*-methylstyrene, 4-phenylstyrene, *m*-methylstyrene, *o*-methylstyrene, *p*-tert-butylstyrene, and dimethylstyrene.

16. The process of claim 13 wherein  $R^1$  and  $R^2$  independently are selected from methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, isopentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, eicosyl, cyclopropyl, 2,2-dimethylcyclopropyl, cyclopentyl, cyclohexyl, methoxymethyl, methoxyethyl, methoxypropyl, methoxybutyl, methoxypentyl, methoxyhexyl, methoxyoctyl, methoxynonyl, ethoxydecyl, ethoxymethyl, ethoxyethyl, ethoxypropyl, ethoxybutyl, ethoxypentyl, ethoxyhexyl, ethoxyheptyl, ethoxyoctyl, ethoxynonyl, ethoxydecyl, propoxymethyl, propoxyethyl, propoxypropyl, propoxybutyl, propoxypentyl, propoxyheptyl, propoxy-



octyl, propoxynonyl, propoxydecyl, butoxymethyl, butoxyethyl, butoxypropyl, butoxybutyl, butoxypentyl, butoxyhexyl, butoxyheptyl, butoxyoctyl, butoxynonyl, butoxydecyl, pentyloxymethyl, pentyloxyethyl, pentyloxypropyl, pentyloxybutyl, pentyloxypentyl, pentyloxyhexyl, pentyloxyoctyl, pentyloxynonyl, pentyloxydecyl, hexyloxymethyl, hexyloxyethyl, hexyloxypropyl, hexyloxybutyl, hexyloxypentyl, hexyloxyhexyl, hexyloxyheptyl, hexyloxyoctyl, hexyloxynonyl, hexyloxydecyl, heptyloxymethyl, heptyloxyethyl, heptyloxypropyl, heptyloxybutyl, heptyloxypentyl, heptyloxyhexyl, heptyloxyheptyl, heptyloxyoctyl, heptyloxynonyl, heptyloxydecyl, octyloxymethyl, octyloxyethyl, octyloxypropyl, octyloxybutyl, octyloxypentyl, octyloxyhexyl, octyloxyheptyl, octyloxyoctyl, octyloxynonyl, decyloxymethyl, decyloxyethyl, decyloxypropyl, decyloxybutyl, decyloxypentyl, decyloxyhexyl, decyloxyheptyl, 1-methylethyl, 1-methylpropyl, 1-methylbutyl, 1-methylpentyl, 1-methylhexyl, 1-methylheptyl, 1-methyloctyl, 1-methylnonyl, 1-methyldecyl, 2-methylpropyl, 2-methylbutyl, 2-methylpentyl, 2-methylhexyl, 2-methylheptyl, 2-methyloctyl, 2,3,3-trimethylbutyl, 3-methylpentyl, 2,3-dimethylpentyl, 2,4-dimethylpentyl, 2,3,3,4-tetramethylpentyl, 3-methylhexyl, and 2,5-dimethylhexyl.

17. The process of claim 13 wherein said maleated polyalkylene comprises mer units derived from at least one of ethylene and propylene.

18. The process of claim 13 wherein said amine comprises from 1 to 50 carbon atoms and is selected from at least one of alkyl amines, alkyl benzyl amines, alkyl phenyl amines, alkoxybenzyl amines, alkyl aminobenzoates, and alkoxy aniline.

19. The process of claim 13 wherein said amine is a primary amine.